

THE MAMMALS OF AMISTAD NATIONAL RECREATION AREA, TEXAS

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National Park Service  
Inventory and Monitoring Program  
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## EXECUTIVE SUMMARY

This report describes a mammal survey of Amistad National Recreation Area (NRA) in Val Verde County, Texas. Field sampling, literature records, and museum vouchers were utilized to compile a current list of mammal fauna. Field work was conducted from May 2003 to July 2004. A systematic survey was conducted using standardized techniques on sample sites stratified over the study area. Small mammals were trapped on 21 transects over 3,150 trap nights, medium-sized mammals were trapped on nine transects over 135 trap nights, and bats were netted at nine sites over 10 nights. Additional records were obtained through observations, collecting in specific habitats (e.g., rocky bluffs, abandoned tunnels, etc.), salvaging road kills, recording sign, and acoustic recordings of bats.

Overall, 67 species of mammals were identified as probably occurring in Amistad NRA, including seven non-native species. The systematic survey design for trapping and mistnetting yielded 12 species of rodents (in order of abundance - *Peromyscus pectoralis*, *Sigmodon hispidus*, *Perognathus merriami*, *Mus musculus*, *Spermophilus mexicanus*, *Peromyscus leucopus*, *Neotoma leucodon*, *N. micropus*, *Chaetodipus nelsoni*, *C. hispidus*, *C. intermedius*, and *Baomys taylori*), six species of larger mammals (*Procyon lotor*, *Didelphis virginiana*, *Dasyus novemcinctus*, *Bassariscus astutus*, *Mephitis mephitis*, and *Spilogale gracilis*), and five species of bats (*Myotis velifer*, *Tadarida brasiliensis*, *Antrozous pallidus*, *M. yumanensis*, and *Pipistrellus hesperus*). Seven species of bats were documented only through acoustic recordings. Four native species (*Sciurus niger*, *Geomys personatus*, *Ondatra zibethicus*, and *Bos bison*) are believed extirpated from the park. Two bats (*Diphylla ecaudata* and *Eptesicus fuscus*), recorded only once  $\geq 30$  years

ago, are considered accidental species. Previous studies documented 41 (Boston 1966), 60 (Lobello 1976), and 60 (Ditton and Schmidly 1977) species. Three native species, the northern pygmy mouse (*Baiomys taylori*), evening bat (*Nycticeius humeralis*), and pocketed free-tailed bat (*Nyctinomops femorosaccus*), appear to be recent immigrants into the area.

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## THE MAMMALS OF AMISTAD NATIONAL RECREATION AREA, TEXAS

Positioned near the boundary of three biotic provinces, Amistad National Recreation Area (NRA) provides a unique opportunity for research. It encompasses the confluences of the Rio Grande with the Pecos and Devils rivers in Val Verde County. The mammal fauna has been studied both before (Boston 1966) and after (Lobello 1976; Ditton and Schmidly 1977; Scudday et al. 1984) reservoir construction. Since these studies, no comprehensive mammalian inventory has been conducted within the park. Wilson et al. (1996) noted that biological surveys are the first step in developing habitat and animal population management strategies.

Our research had four main objectives. The first objective was to document the current mammal fauna occurring in Amistad NRA; knowledge of the current fauna will allow park personnel to make informed management decisions and identify areas in need of further research. The second objective was to assess any changes that have occurred in species found within the park since the previous studies were conducted. The third objective was to establish permanent transects to allow park personnel to monitor changes in animal populations over time. The fourth objective was to determine the distribution of the various mammals within Amistad NRA. This information will be of value in determining the effectiveness of current management practices and making decisions on future management and conservation issues.

## MATERIALS AND METHODS

*Study Area.*--Amistad Dam (29° 26' 59" N, 101° 03' 29" W) was built in 1969 below the confluence of the Rio Grande and the Devils River. Lake Amistad



International Reservoir has approximately 1,432 km of shoreline, 869 km in the United States and 563 km in Mexico. Amistad NRA is located in Val Verde County, Texas (Figure 1) and consists of 23,186 ha, including areas covered by the reservoir. The actual land area of the NRA fluctuates with changing lake levels. Normal conservation level of Lake Amistad is 340.5 m. At this level, the lake contains 27,115 ha of water, and inundates 119 km of the Rio Grande, 39 km of the Devils River, and 23 km of the Pecos River. Water in the reservoir is used for municipal and irrigation purposes for communities downstream along the Rio Grande (National Park Service 2004).

Amistad NRA lies near the boundaries of three biotic provinces: the Balconian, Chihuahuan, and Tamaulipan (Blair 1950). Average annual precipitation in Del Rio is 469 mm, with >80% of all precipitation occurring from April to October in showers and heavy thunderstorms. Average monthly temperatures vary from 10°C in winter to 27°C in summer. From June to August the temperature exceeds 32°C >80% of the time (National Weather Service 2003).

McMahan et al. (1984) classified Amistad NRA as being in the cenizo (*Leucophyllum frutescens*), blackbrush (*Acacia rigidula*), creosotebush (*Larrea tridentata*) association. The plants of this association, common to the park, include guajillo (*Acacia berlandieri*), honey mesquite (*Prosopis glandulosa*), prickly pear (*Opuntia* spp.), sotol (*Dasyllirion* spp.), catclaw (*Mimosa* spp.), hairy tridens (*Erioneuron pilosum*), slim tridens (*Tridens muticus*), and pink pappusgrass (*Pappophorum bicolor*). Species common to the riparian areas include common reed (*Phragmites australis*), seepwillow (*Baccharis* spp.), willow (*Salix* spp.), tobacco tree (*Nicotiana glauca*),

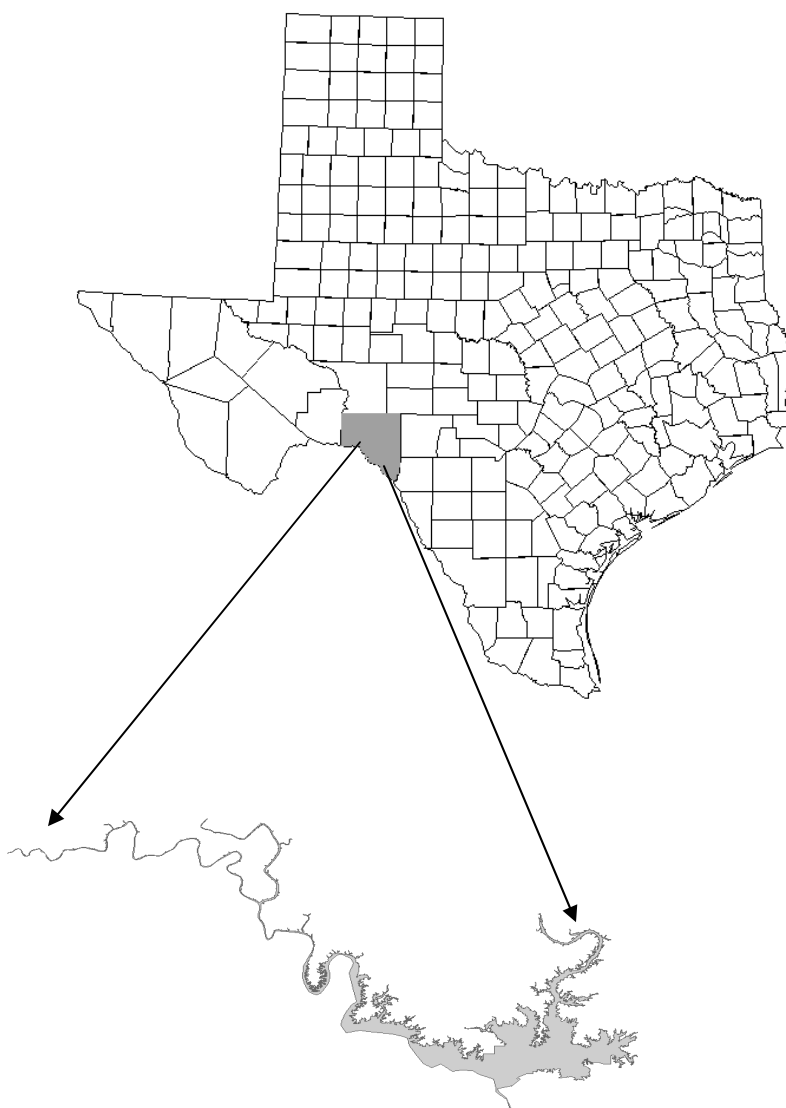


Figure 1. Location of Amistad National Recreation Area in Val Verde County, Texas.

tamarisk (*Tamarix* spp.), and bermudagrass (*Cynodon dactylon*).

*Design.*--To document the current mammal fauna of Amistad NRA, trap sites were stratified across the area based on habitat. Sample sites were chosen based on maps developed by David Larson, former Resource Manager for Amistad NRA. A minimum of two transects were sampled for small mammals in each of nine habitat types as designated by Larson. Transects were randomly located within each site and sampled for three consecutive nights. Nine additional transects were sampled for medium and large mammals. A minimum of one night of mist netting was conducted to sample bats at each of nine sites designated by Larson. Additional records were obtained through observations, collecting in specific habitats (e.g., rocky bluffs, abandoned tunnels, etc.), salvaging road kills, recording sign, and recording echolocations of bats. Fieldwork was conducted from May 2003 to July 2004. Taxonomy and common names follow Baker et al. (2003). All animals collected as voucher specimens were deposited in the James F. Scudday Vertebrate Collection at Sul Ross State University. Museum collections and literature records were accessed and compiled to complement trapping results and provide a comprehensive checklist of mammals.

*Small Mammal Survey.*--Small mammals were trapped using Sherman live traps (Model LFA 7.6 cm x 8.9 cm x 22.9 cm). Twenty-one sites were trapped (Figure 2). Each site contained two parallel transects consisting of 25 traps per transect. Traps were placed every 15 m, with one trap per station and 20 m between transects. Traps were closed during the morning (~0700 h) and reopened and baited with a 1:1 mixture of scratch grain and rolled oats in the evening (~1600 h) for three consecutive nights. Coordinates were recorded for the center of the two transects. All animals collected for museum



Figure 2. Location of 21 small mammal sampling sites at Amistad National Recreation Area, Val Verde County, Texas.

deposition had coordinates recorded for the actual capture site. Data recorded for each capture included date, time, trap station, species, sex, age, and reproductive condition. Captured animals were marked by toe clipping and released at the trap location. Individual traps or groups of traps were used in certain situations to trap an area that appeared to have high potential to produce undocumented species. Visual surveys, firearms, and gratuitous encounters were used to document small mammal fauna not readily captured in Sherman live traps.

*Medium and Large Mammal Survey.*--Medium-sized mammals were trapped using Tomahawk Economy Rabbit Traps (22.9 cm x 22.9 cm x 66.0 cm) and Economy Raccoon Traps (25.4 cm x 30.5 cm x 81.3 cm). One transect consisting of five traps, spaced at 100 m, was placed in each of nine sites (Figure 3). Traps were opened and baited with sardines in the evening and closed the following morning for three consecutive nights. Data recorded for each capture included date, time, trap station, species, sex, age, and reproductive condition. Captured animals were released at the capture site. Coordinates were recorded for the third trap in each transect and the associated coordinates were used to represent the transect. All animals collected for museum deposition had coordinates recorded for the actual capture site. Spotlight counts, roadkills, spoor, and gratuitous encounters were also utilized to document medium and large mammal species not readily captured.

*Bat Survey.*--Bats were sampled using mist nets at nine sites (Figure 4). Size, placement, and number of nets were determined by conditions at the site. Mist nets were opened at dusk and remained open until activity of bats ceased. At roost sites, a harp trap and visual surveys were used as appropriate for each situation. In all situations, efforts

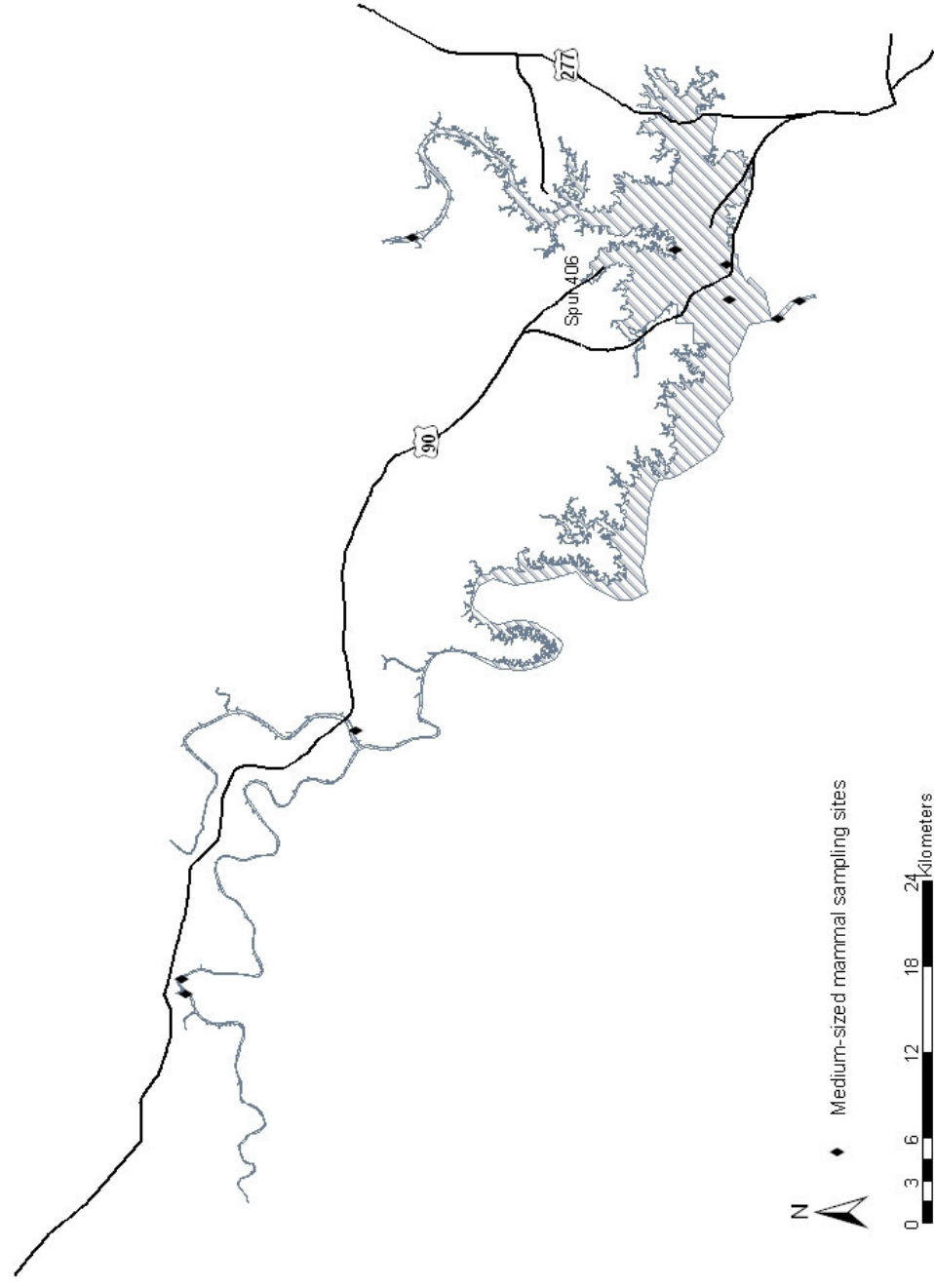


Figure 3. Location of nine medium-sized mammal trapping sites at Amistad National Recreation Area, Val Verde County, Texas.

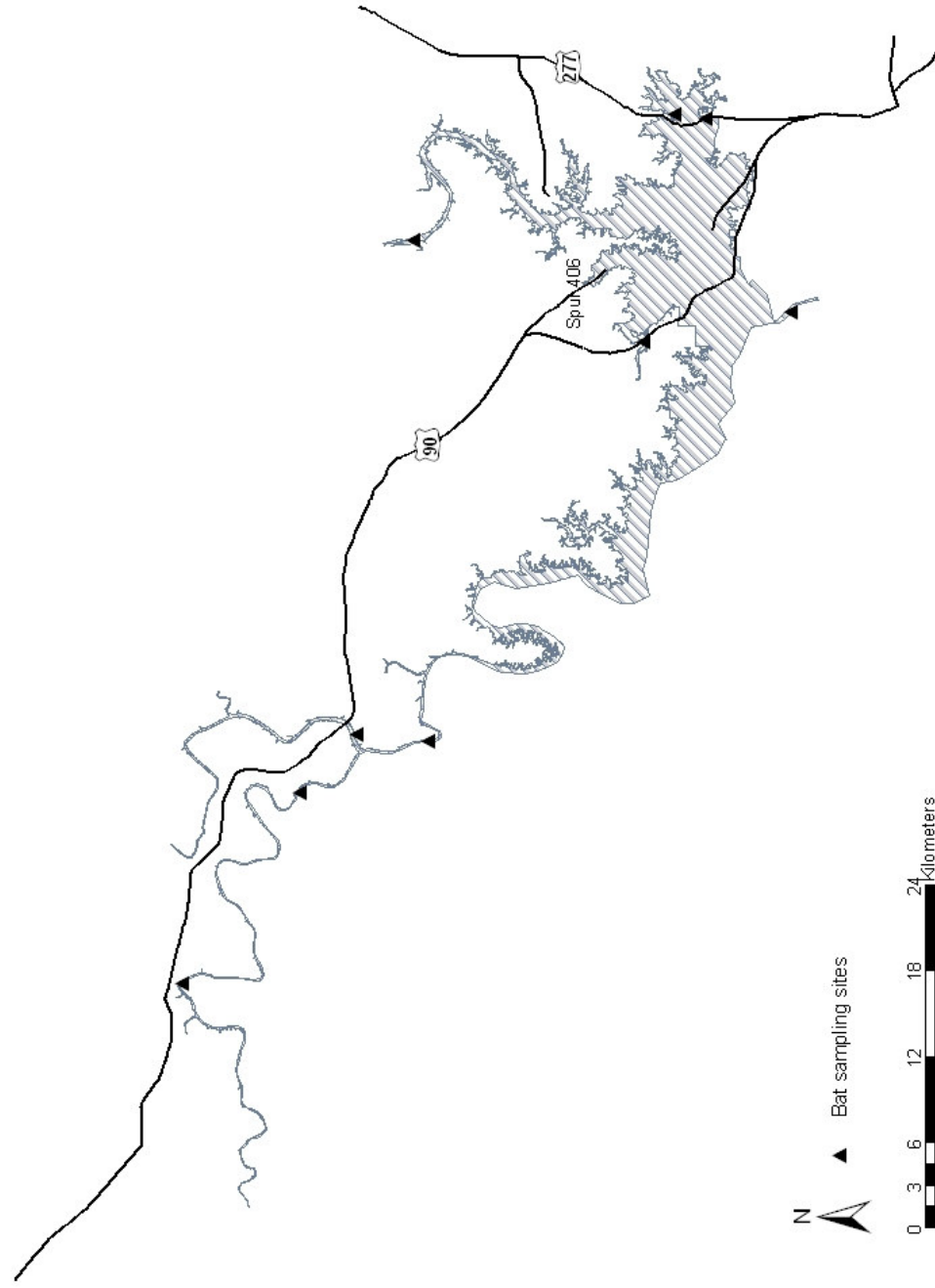


Figure 4. Location of nine bat sampling sites at Amistad National Recreation Area, Val Verde County, Texas.

were made to minimize disturbance to roosting animals. Data recorded for each capture included date, time, mist net location, species, sex, age, and reproductive condition.

Captured animals were released at the site. An Anabat II detector (Titley Electronics, Ballina, Australia) was used in 2004 to identify bats acoustically. Bats were also removed by hand at roost sites, when opportunity permitted. Coordinates were recorded for each bat sampling site and assigned to all bats captured and/or collected at the site.

*Museum Records.*--Lists of specimens collected in Val Verde County were obtained from the following institutions: Abilene Christian University, American Museum of Natural History, Carnegie Museum of Natural History, Field Museum of Natural History, Illinois Natural History Survey, Natural History Museum of Los Angeles County, Smithsonian Institution National Museum of Natural History, Sul Ross State University, Texas Cooperative Wildlife Collection, The Museum of Texas Tech University, University of Kansas, and University of Michigan.

## RESULTS

*Small Mammal Survey*--Twelve species of rodents, totaling 160 individuals were captured during 3,150 trap nights (Table 1). Overall trap success (total captures/total trap nights) was 5.9% and ranged from 0% on Transects 6, 12, and 21 to 35.3% on Transect 9 (Table 2). Transect 9 was located on the east side of the Pecos River in the floodplain. Vegetation was dominated by exotic weeds and salt cedar (*Tamarix* spp.). Transect 14, while only having a success rate of 0.7%, did produce *Chaetodipus nelsoni*, a species rarely encountered during other sampling. The vegetation of this transect was



Table 1. Number of individual small mammals captured in Sherman traps by species during 3,150 trap nights on 21 permanent transects at Amistad National Recreation Area, Val Verde County, Texas, 2003.

Site	Species											
	<i>Peromyscus pectoralis</i>	<i>Neotoma leucodon</i>	<i>Neotoma micropus</i>	<i>Perognathus merriami</i>	<i>Spermophilus mexicanus</i>	<i>Sigmodon hispidus</i>	<i>Peromyscus leucopus</i>	<i>Baomys taylori</i>	<i>Chaetodipus hispidus</i>	<i>Chaetodipus intermedius</i>	<i>Chaetodipus nelsoni</i>	<i>Mus musculus</i>
1	1	1		2	1							
2	3			9								
3				1								
4	13					2	1	1				
5	1			1		2	1					
6												
7				9								
8	1			1							1	
9	5					27	1					13
10	5					8						4
11	1					1						
12												
13							1					
14											1	
15					2							
16	2					4				1		
17	8											
18	1						2		1			
19	2		1	3								
20	1	3	2	4	4							
21												
Total (n)	44	4	3	30	7	44	6	1	1	1	2	17
Total (%)	27.3	2.5	1.9	18.8	4.4	27.3	3.8	0.6	0.6	0.6	1.2	10.6

Table 2. Total captures in Sherman traps by species and trap success during 3,150 trap nights on 21 permanent transects at Amistad National Recreation Area, Val Verde County, Texas, 2003.

Site	Species											Total Captures (n)	Trap Success (%)
	<i>Peromyscus pectoralis</i>	<i>Neotoma leucodon</i>	<i>Neotoma micropus</i>	<i>Perognathus merriami</i>	<i>Spermophilus mexicanus</i>	<i>Sigmodon hispidus</i>	<i>Peromyscus leucopus</i>	<i>Baoinys taylori</i>	<i>Chaetodipus hispidus</i>	<i>Chaetodipus intermedius</i>	<i>Chaetodipus nelsoni</i>	<i>Mus musculus</i>	
1	2	1		2	1							6	4.0
2	3			9								12	8.0
3				1								1	0.7
4	20					2	1	1				24	16.0
5	1			1		3	1					6	4.0
6												0	0.0
7				10								10	6.7
8	1			1							1	3	2.0
9	5					34	1					13	53
10	5					9						4	18
11	1					1							2
12													0
13							1						1
14											1		1
15					2								2
16	4					5				1			10
17	9												9
18	1						2		1				4
19	1		1	3									5
20	1	3	2	4	6								16
21													0
Total	54	4	3	31	9	54	6	1	1	1	2	17	183

Chihuahuan Desert scrub. *Peromyscus pectoralis* and *Sigmodon hispidus* both comprised 27.3% of the total captures (Figure 5).

*Medium and Large Mammal Survey*--A total of 21 medium-sized mammals representing six species were trapped during 135 trap nights. Species caught were *Didelphis virginiana* ( $n = 6$ ), *Dasypus novemcinctus* ( $n = 2$ ), *Bassariscus astutus* ( $n = 2$ ), *Procyon lotor* ( $n = 8$ ), *Mephitis mephitis* ( $n = 2$ ), and *Spilogale gracilis* ( $n = 1$ ). One juvenile *Sylvilagus audubonii* was captured in a Sherman trap. Twelve additional species were identified using other methods (firearms, visual surveys, spoor, road kills): *Lepus californicus*, *Sylvilagus floridanus*, *Castor canadensis*, *Erethizon dorsatum*, *Canis latrans*, *Urocyon cinereoargenteus*, *Conepatus mesoleucus*, *Pecari tajacu*, *Odocoileus virginianus*, *Felis catus*, *Ovis aries*, and *Ammotragus lervia*.

*Bat Survey*--From May 2003 to July 2004, a total of 29 bats, representing five species, were captured during 10 nights of mistnetting. Species caught (in order of decreasing abundance) were *Myotis velifer* ( $n = 10$ ), *Tadarida brasiliensis* ( $n = 7$ ), *Antrozous pallidus* ( $n = 5$ ), *M. yumanensis* ( $n = 5$ ), and *Pipistrellus hesperus* ( $n = 2$ ). One night of harp trapping resulted in 155 *T. brasiliensis* and 21 *M. velifer*. A colony of *Eumops perotis* was documented by visual identification at a roost site, and one *Corynorhinus townsendii* was observed and collected at a roost site. Twelve species were identified during five nights of recording with an Anabat II detector (Titley Electronics, Ballina, Australia). The seven species documented exclusively through this method were *Mormoops megalophylla*, *Pipistrellus subflavus*, *Nycticeius humeralis*, *Lasiurus cinereus*, *Nyctinomops macrotis*, *Nyctinomops femorosaccus*, and a second unidentified species of *Lasiurus*.

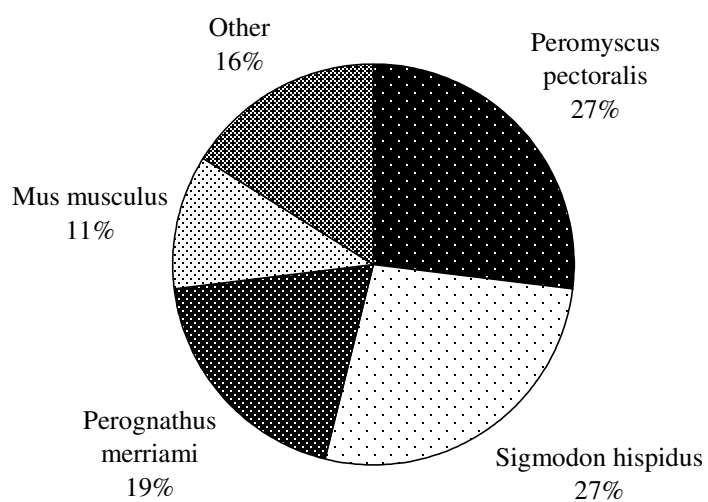


Figure 5. Relative abundance of small mammal species based on number of individuals captured, at Amistad National Recreation Area, Val Verde County, Texas, 2003.

*Museum Records*--Museum collections accounted for nine species not documented during the study that may currently occur within Amistad NRA. *Cryptotis parva*, *Notiosorex crawfordi*, *Thomomys bottae*, *Chaetodipus eremicus*, *Dipodomys merriami*, *Onychomys leucogaster*, *Peromyscus maniculatus*, *Reithrodontomys fulvescens*, and *Rattus rattus* were confirmed through museum records.

## DISCUSSION

This survey documented 50 mammal species at Amistad NRA and found literature records that support the occurrence of an additional 17 species. Each subsequent inventory has revealed species not documented during previous studies. Boston (1966) documented 41 species, while both Lobello (1976) and Ditton and Schmidly (1977) documented 60 species. Lobello (1976) listed the hispid pocket mouse (*Chaetodipus hispidus*) as possibly being extirpated from the area. The following year Ditton and Schmidly (1977) reported collecting six specimens of the species. One hispid pocket mouse was captured during the study, but further work is needed to assess the current status in Amistad NRA.

The current work has added several previously undocumented species to the mammal fauna of Amistad NRA. The northern pygmy mouse (*Baiomys taylori*), cactus mouse (*Peromyscus eremicus*), rock pocket mouse (*Chaetodipus intermedius*), evening bat (*Nycticeius humeralis*), big free-tailed bat (*Nyctinomops macrotis*), pocketed free-tailed bat (*N. femorosaccus*), and black bear (*Ursus americanus*) are native species that were undocumented by the previous studies. With the exception of the northern pygmy mouse, evening bat, and pocketed free-tailed bat, none of the native mammals captured

during this study appear to be expanding their range, and the increase in total species is probably an artifact of increased sampling in and around Amistad NRA.

Amistad NRA has a very diverse bat community. Of the 33 species found in Texas (Schmidly 1991), 16 can be expected in the vicinity of the park. Protection of roosting sites should be a management priority. The park should also invite researchers to establish quantitative data for each species and to identify specific needs for conservation and management.

The house mouse (*Mus musculus*), black rat (*Rattus rattus*), nutria (*Myocastor coypus*), feral cat (*Felis catus*), feral pig (*Sus scrofa*), mouflon sheep (*Ovis aries*), and aoudad (*Ammotragus lervia*) are non-native animals now present in Amistad NRA. The presence of these mammals in Amistad NRA can be attributed directly to humans. House mice and black rats are commensals with humans. Nutria were introduced for their pelt. Feral cats were introduced by abandonment of or lack of responsibility for house pets. Feral pigs, mouflon, and aoudad were introduced by man for the purpose of sport. These animals can negatively impact native species. Park personnel need to take a proactive approach to managing these species to limit destruction of native flora and fauna.

The order Carnivora is the least documented mammalian group at Amistad NRA. To better manage these species, further research is warranted for each family in this order with the possible exception of the procyonids.

## ANNOTATED SPECIES DESCRIPTIONS

## Order Didelphimorphia

## Family Didelphidae

*Didelphis virginiana* Kerr 1792 (Virginia Opossum): Six specimens of opossum were captured: two were collected (SRSU 3189 & SRSU 3190) in Eagle Nest Canyon below Jack Skiles ranch in Langtry, TX; two were captured below the dam along the Rio Grande; and two were captured 0.5 km west of Highway 277 N, near the old Boy Scout Camp. This species is common in riparian areas and close to the lake and less abundant in areas away from water.

## Order Insectivora

## Family Soricidae

*Cryptotis parva* (Say 1823) (Least Shrew): No least shrews were documented during this study. Davis (1941) reported a single least shrew specimen from “Del Rio.” V. Bailey collected one shrew (USNM 018359) in Del Rio in 1890. The least shrew is an inhabitant of grasslands where it utilizes the surface runways of cotton rats (*Sigmodon*) and other grassland rodents (Davis and Schmidly 1994). Trapping of shrews is difficult and often requires the use of pitfall traps. Our failure to document this species may be due to limited trapping of this sort during the study.

*Notiosorex crawfordi* (Coues 1877) (Crawford’s Desert Shrew): No desert shrews were documented during this study. Boston (1966) captured a desert shrew “along northern San Pedro Creek” and collected two individuals near Del Rio (SRSU 868 & SRSU 3009). Davis and Schmidly (1994) report that this species does not appear to be restricted to any particular habitat, although it is typically found in more arid parts of

Texas. As was the case with the least shrew, limited trapping was conducted for the species. This species probably still ranges throughout Amistad NRA in low densities.

#### Order Chiroptera

##### Family Mormoopidae

*Mormoops megalophylla* Peters 1864 (Ghost-faced Bat): This species, although not captured during the current work, was documented by acoustic recording. Schmidly (1991) reported this bat occurring in lowland areas, especially desert scrub and riverine habitats. Weyandt et al. (2001) reported collecting this species in Eagle Nest Canyon near Langtry.

##### Family Phyllostomidae

*Diphylla ecaudata* Spix 1823 (Hairy-legged Vampire Bat): Amistad NRA is the only recorded occurrence of this vampire bat in the United States (Schmidly 1991). Reddell (1968) reported this species as being collected (TTU 5658) from an abandoned railroad tunnel west of Comstock. No additional specimens have been recorded since. Multiple trips have been made to this site since the time of collection, including three trips during this study. It is unlikely the species is a common resident of Amistad NRA.

##### Family Vespertilionidae

*Myotis velifer* (J. A. Allen 1890) (Cave Myotis): Two specimens (SRSU 3169 & SRSU 3170) of cave myotis were collected during the study and vocalizations were commonly recorded. Thirty-one cave myotis were captured during mistnetting and harp trapping efforts. The species was represented by 15 males and 15 females. One individual escaped before the sex was recorded. This species was the most common bat mistnetted during the study, comprising 34.5% of the total bat captures.



*Myotis yumanensis* (H. Allen 1864) (Yuma Myotis) : This species was captured in Eagle Nest Canyon and at the Pecos River boat ramp. Two specimens (SRSU 3174 & SRSU 3175) were collected during the study. This species comprised 17.2% of the bats mistnetted and was represented by two males, two females, and one individual that escaped before sex was recorded.

*Lasiurus borealis* (Müller 1776) (Eastern Red Bat): The eastern red bat was not captured during the study, but may occur near the northern limits of the park on the Devils River. The bat is a tree-roosting, forest dwelling species and a specimen has been collected in Val Verde County (Schmidly 1991). Brant and Dowler (2001) collected this species from Devils River State Natural Area, 72 km north of Amistad NRA. This species is probably uncommon in Amistad NRA due to limited availability of preferred roosting sites.

*Lasiurus cinereus* (Palisot de Beauvois 1796) (Hoary Bat): Although not captured during the current work, this species was documented by acoustic recording and can be expected to occur in Amistad NRA. Weyandt et al. (2001) reported collecting this species in Eagle Nest Canyon near Langtry. Boston (1966) collected (SRSU 920) this species near Del Rio. This species roosts in trees and is probably uncommon in Amistad NRA due to limited availability of preferred roosting sites.

*Lasiurus seminolus* (Rhoades 1895) (Seminole Bat): The seminole bat was not captured during the study, but may occur near the northern limits of the park on the Devils River. Brant and Dowler (2001) collected this species from Devils River State Natural Area, 72 km north of Amistad NRA. This species is probably uncommon in Amistad NRA due to limited availability of preferred roosting sites.

*Pipistrellus hesperus* (H. Allen 1864) (Western Pipistrelle): This species was only captured at the Pecos River boat ramp. Two specimens (SRSU 3145 & SRSU 3146) were collected during the study. This species comprised 6.9% of the total bats mistnetted and was represented by two females.

*Pipistrellus subflavus* (F. Cuvier 1832) (Eastern Pipistrelle): Although not captured during the study, this bat was documented by acoustic recording. Schmidly (1991) lists several museum specimens (USNM 126729, USNM 129836, USNM 129837, & TTU 7196) collected in the vicinity of Amistad NRA. These bats roost singly or in small groups in caves, mines, rock crevices, tree foliage, and occasionally in buildings (Schmidly 1991).

*Eptesicus fuscus* (Palisot de Beauvois 1796) (Big Brown Bat): Lobello (1976) reported this species as being collected on 2 July 1974 along the Rio Grande “2 mi W of Pecos River, in old abandoned railroad tunnel.” He also states that it is the only record for the big brown bat in Val Verde County. Ditton and Schmidly (1977) list this species as occurring in Amistad NRA, but did not collect any specimens. Schmidly (1991) does not list the specimen reported by Lobello (1976) and does not include Amistad NRA as being within the distribution of the big brown bat. The specimen listed by Lobello (1976) was unable to be located. This species roosts most commonly in buildings, but may also use hollow trees, rock crevices, tunnels, and cliff swallow nests (Schmidly 1991). Habitat is available in Amistad NRA and further effort may produce additional records for this species.

*Nycticeius humeralis* (Rafinesque 1819) (Evening Bat): The evening bat was documented via acoustic recording below Amistad Dam on 27 July 2004. This species

was only recently documented in Val Verde County at Devils River State Natural Area (Dowler et al. 1999). This species appears to be expanding its range westward (Schmidly 2004).

*Corynorhinus townsendii* (Cooper 1837) (Townsend's Big-eared Bat): One male Townsend's big-eared bat was collected (SRSU 3141) from a drainage tunnel under the old railroad bed running adjacent to the Rio Grande on the Lowry Ranch. The male was the only bat occupying the tunnel. Weyandt et al. (2001) collected this species in Eagle Nest Canyon near Langtry.

*Antrozous pallidus* (Le Conte 1856) (Pallid Bat): The pallid bat was documented at Eagle Nest Canyon, the Rio Grande, and the Pecos River by both capture and acoustic recording. One specimen (SRSU 3185) was collected from Eagle Nest Canyon. This species comprised 17.2% of the total bats mistnetted and was represented by three males and two females.

#### Family Molossidae

*Tadarida brasiliensis* (I. Geof. St.-Hilaire 1824) (Brazilian Free-tailed Bat): This species was the most frequently documented bat during the study by capture and vocalization. Four specimens (SRSU 3135, SRSU 3138, SRSU 3139, & SRSU 3140) were collected from throughout Amistad NRA. During the study, 162 free-tailed bats (130 females, 32 males) were captured. The vast majority (155) were captured during one night of harp trapping over the entrance of an abandoned railroad tunnel. This species comprised 24.1% of the total bats mistnetted. All males captured from the railroad tunnel were juveniles, representing young of the year.

*Nyctinomops femorosaccus* (Merriam 1889) (Pocketed Free-tailed Bat): This bat was not captured during the study, but it was documented with acoustic recordings on the Pecos and Devils rivers. There were no previous reports of this species in Amistad NRA, and further work is needed to determine its abundance and distribution throughout the park.

*Nyctinomops macrotis* (Gray 1839) (Big Free-tailed Bat): This bat was not captured during the current study, but acoustic recordings of it were made near the Pecos River boat ramp on 19 May 2004. Its range includes Amistad NRA (Schmidly 1991). This species was heard and observed by researchers from Bat Conservation International on 15 May 1999, while mistnetting at Amistad NRA (unpub. park doc.). The bat is uncommon and poorly known in Texas and further work is needed throughout its range.

*Eumops perotis* (Schinz 1821) (Western Bonneted Bat): The western mastiff bat is the largest bat found in the United States. Due to the large size of the species, they have difficulty taking flight and require a roosting site with an unobstructed drop of at least 3 m (Schmidly 1991). One roost of about 13 mastiff bats was observed 1 km southeast of Jack Skiles Ranch in Langtry on 1 August 2003. Acoustic recordings of the species were made near the Pecos River boat ramp on 19 May 2004. Weyandt et al. (2001) reported the species from Eagle Nest Canyon. The species is probably limited in distribution in Amistad NRA by its roost site requirements.

#### Order Xenarthra

#### Family Dasypodidae

*Dasypus novemcinctus* Linnaeus 1758 (Nine-banded Armadillo): This species is common in the riparian areas of the park. Davis and Schmidly (1994) note that in arid

areas, armadillos concentrate in the vicinity of streams and water holes. One armadillo was captured below Amistad Dam, another was captured in Eagle Nest Canyon, and several roadkills were seen in other areas of the park. No specimens were collected during the study.

### Order Lagomorpha

#### Family Leporidae

*Sylvilagus* spp. (Cottontail): Three specimens of cottontails were collected (SRSU 3118, SRSU 3184, & SRSU 3191) during the study. At the time of report submission, one skull (SRSU 3191) had not been adequately cleaned to determine species. The two species documented at Amistad NRA are described below.

*Sylvilagus audubonii* (Baird 1858) (Desert Cottontail): Ditton and Schmidly (1977) report this species to be the more common of the two *Sylvilagus* within Amistad NRA. This determination was made based on personal judgment of the size of individuals encountered. One specimen of desert cottontail (SRSU 3118) was collected at Governor's Landing. Historically, this species occurred in the area and was collected near Langtry (USNM 127148), the mouth of the Devils River (USNM 023947, USNM 024073, USNM 024074, & USNM 024075) and along the Rio Grande south of Comstock (USNM 120012), near the beginning of the 20<sup>th</sup> century.

*Sylvilagus floridanus* (Allen 1890) (Eastern Cottontail): Lobello (1976) reported this species to be the more common of the two *Sylvilagus* within Amistad NRA. This determination was also made based on personal judgment of the size of individuals encountered. One specimen of eastern cottontail (SRSU 3184) was collected near the fish cleaning station at Diablo East. As is the case with the desert cottontail, this species was

historically collected at Comstock (USNM 023948, USNM 023949, USNM 108611, & USNM 117681), near the turn of the 20<sup>th</sup> century. Boston (1966) collected a specimen (SRSU 967), “4 miles west of Del Rio.” Field identification of five roadkilled animals was based on a ratio of ear length to hind foot length (Davis and Schmidly 1994) and recognized all as *S. floridanus*, although this method has been shown to be inconsistent (Brant and Dowler 2001).

*Lepus californicus* Gray 1837 (Black-tailed Jackrabbit): This species is common throughout Amistad NRA. Jackrabbits were seen in every habitat type, except for riparian areas with thick vegetation. No specimens were collected during the study.

#### Order Rodentia

#### Family Sciuridae

*Ammospermophilus interpres* (Merriam 1890) (Texas Antelope Squirrel): One specimen of antelope squirrel (SRSU 3133) was collected from the bank fishing/picnic area at Diablo East. A lone individual was also seen at Governor's Landing. The species was found in association with sparse vegetation and large rock outcrops and is considered to be common in these habitat types.

*Spermophilus mexicanus* (Erxleben 1777) (Mexican Ground Squirrel): A total of nine Mexican ground squirrels were captured and two specimens (SRSU 3147 & SRSU 3151) were collected during the study. This species is common throughout the park, with the exception of dense vegetation common to riparian areas, and can often be seen crossing roads during the day.

*Spermophilus spilosoma* Bennett 1833 (Spotted Ground Squirrel): This species was not encountered during the current study. Lobello (1976) and Ditton and Schmidly

(1977) both list the species as possibly occurring in Amistad NRA, but no voucher specimens were obtained. Davis and Schmidly (1994) list a specimen from Val Verde County and the species may occur in the park, but densities are probably low.

*Spermophilus variegatus* (Erxleben 1777) (Rock Squirrel): Three rock squirrels were captured and one specimen (SRSU 3134) was collected during the study. The specimen was collected 0.5 km northeast of the ranger station on the Pecos River. Many other specimens were seen in association with large rocky cliffs common in the park.

*Sciurus niger* Linnaeus 1758 (Eastern Fox Squirrel): This species, although common within the city limits of Del Rio, is doubtful to occur in Amistad NRA. The most recent specimens (USNM 117565, USNM 117566, USNM 117567, USNM 117568, & USNM 11761) in the Amistad NRA region (not from Del Rio city limits) known to the authors are from “13 miles south of Juno”. V. Bailey and M. Cary collected the specimens in July 1902. This species is often associated with mast producing trees, which have been lost to inundation. The loss of riparian soils and constant inundation of suitable areas, make regeneration of habitat for the species unlikely.

#### Family Geomyidae

No gophers were obtained during this study, and no sign was observed within the park.

*Thomomys bottae* (Eydoux and Gervais 1836) (Botta’s Pocket Gopher): Three specimens (USNM 023944, USNM 023945, & USNM 108607) were collected near Comstock and one specimen (USNM 117572) was collected “13 mi South of Juno” on the Devils River near the beginning of the 20<sup>th</sup> century. Ditton and Schmidly (1977) reported seeing sign of this pocket gopher, although none were collected. They noted the

species ability to occupy the shallower more rocky soils common throughout Amistad NRA.

*Geomys personatus* True 1889 (Texas Pocket Gopher): Texas pocket gophers are typically found in sandy soils (Davis and Schmidly 1994). Both Lobello (1976) and Ditton and Schmidly (1977) reported that this species of pocket gopher was probably extirpated by inundation.

*Cratogeomys castanops* (Baird 1852) (Yellow-faced Pocket Gopher): Davis and Schmidly (1994) list a record of this species from Val Verde County, but no specimens have been collected from Amistad NRA. It is doubtful that this species occurs in Amistad NRA, due to its preference for deep, mellow soils that are relatively free from rocks (Davis and Schmidly 1994). This type of habitat is uncommon within the boundaries of the park.

#### Family Heteromyidae

*Perognathus merriami* J. A. Allen 1892 (Merriam's Pocket Mouse): A total of 31 Merriam's pocket mice were captured throughout the park and four specimens (SRSU 3144, SRSU 3173, SRSU 3177, & SRSU 3181) were collected. The species was captured in association with sparse vegetation and bare soil, which are common throughout Amistad NRA. Ditton and Schmidly (1977) listed the species as *Perognathus flavus*, but Lee and Engstrom (1991) have since shown that only Merriam's Pocket Mouse occurs in the area. This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, *Neotoma micropus*, *N. leucodon*, *Spermophilus mexicanus*, *Ammospermophilus interpres*, and *Chaetodipus nelsoni*.



*Chaetodipus eremicus* (Mearns 1898) (Chihuahuan Desert Pocket Mouse): This species was not captured during this study. The only known collection was one skull (USNM 127587) collected by J. H. Gaut on 3 July 1903. Although no captures were recorded, this species is likely to occur throughout Amistad NRA at low densities.

*Chaetodipus hispidus* Baird 1858 (Hispid Pocket Mouse): One hispid pocket mouse was captured north of 277 North campground. This species prefers sand or other friable soil with scattered to moderate stands of herbaceous vegetation (Davis and Schmidly 1994). The predominance of shrubs throughout the park probably limits the distribution of this pocket mouse.

*Chaetodipus intermedius* Merriam 1889 (Rock Pocket Mouse): One specimen of rock pocket mouse (SRSU 3168) was captured and collected during the study. This species was not encountered in the previous studies and its current presence is probably an artifact of increased trapping effort rather than range expansion. This species is likely to occur throughout Amistad NRA in low densities.

*Chaetodipus nelsoni* Merriam 1894 (Nelson's Pocket Mouse): Two specimens of Nelson's pocket mouse (SRSU 3129 & SRSU 3176) were captured and collected during the study. This species is a rock-loving species (Davis and Schmidly 1994) and due to the prevalence of suitable habitat, could be more common than indicated by the low capture rate. This species was captured in association with *Peromyscus pectoralis* and *Perognathus merriami*.

*Dipodomys merriami* Mearns 1890 (Merriam's Kangaroo Rat): No specimens of kangaroo rat have been collected in Amistad NRA, although Davis and Schmidly (1994) list a county record for Val Verde County. The only specimens known to the authors are

two (USNM 126435 & USNM 126436) collected “15 miles west of Langtry” in 1903 by J. H. Gaut. Lobello (1976) and Ditton and Schmidly (1977) both list the species as probable in the park, although the lack of a specimen from any of the previous trapping efforts and a lack of noticeable sign would indicate otherwise.

#### Family Castoridae

*Castor canadensis* Kuhl 1820 (American Beaver): Thirteen beavers were encountered on the Rio Grande on 1 August 2004. One beaver was seen on the Devils River near the northern boundary of the park and an abundance of sign was seen along the Pecos River. Although no specimens were collected, the species is considered to be common in the riverine portions of Amistad NRA.

#### Family Muridae

*Reithrodontomys fulvescens* J. A. Allen 1894 (Fulvous Harvest Mouse): No harvest mice have been collected within Amistad NRA, but Davis and Schmidly (1994) list a record for Val Verde County. V. Bailey collected two specimens (USNM 018355 & USNM 018358) in 1890 in Del Rio. This species prefers grassy or weedy vegetation (Davis and Schmidly 1994). This habitat type is limited to riverine areas of the park and would therefore limit the range of this species in Amistad NRA.

*Peromyscus eremicus* (Baird 1858) (Cactus Mouse): This species was not documented during any of the previous studies, but one specimen (SRSU 3183) was collected. The species has been recorded for Val Verde County (Davis and Schmidly 1994) and its previous absence from Amistad NRA is most likely an artifact of increased trapping effort. This species was captured in association with *Peromyscus pectoralis*,

*Sigmodon hispidus*, *Neotoma micropus*, *N. leucodon*, *Spermophilus mexicanus*, *Ammospermophilus interpres*, and *Perognathus merriami*.

*Peromyscus leucopus* (Rafinesque 1818) (White-footed Mouse): This species was locally common in areas of dense vegetation. A total of six white-footed mice were captured and five specimens (SRSU 3113, SRSU 3126, SRSU 3132, SRSU 3149, & SRSU 3165) were collected throughout Amistad NRA. This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, *Mus musculus*, *Baiomys taylori*, *Perognathus merriami*, and *Chaetodipus hispidus*.

*Peromyscus maniculatus* (Wagner 1845) (Deer Mouse): Listed by Ditton and Schmidly (1977) as possibly occurring in Amistad NRA, the deer mouse was not collected. Boston (1966) did collect several specimens near Langtry (SRSU 2213, SRSU 2225, & SRSU 2226) and at the mouth of the Devils River (SRSU 881, SRSU 883, & SRSU 884). The species is known to be a generalist and may possibly occur within the park in low densities.

*Peromyscus pectoralis* Osgood 1904 (White-ankled Mouse): This species was the most commonly captured rodent species during this study and the studies of Lobello (1976) and Ditton and Schmidly (1977). A total of 54 white-ankled mice were captured throughout the park in all habitat types, including man-made structures. Twelve specimens (SRSU 3114, SRSU 3115, SRSU 3119, SRSU 3128, SRSU 3130, SRSU 3142, SRSU 3143, SRSU 3164, SRSU 3166, SRSU 3167, SRSU 3179, & SRSU 3182) were collected during the study. This species was captured in association with *Sigmodon hispidus*, *Mus musculus*, *Perognathus merriami*, *Neotoma micropus*, *N. leucodon*, *Peromyscus pectoralis*, *Peromyscus eremicus*, *Spermophilus mexicanus*,

*Ammospermophilus interpres*, *Baiomys taylori*, *Chaetodipus hispidus*, and *Chaetodipus intermedius*.

*Baiomys taylori* (Thomas 1887) (Northern Pygmy Mouse): One pygmy mouse specimen (SRSU 3171) was captured and collected 250 m east of the washed out bridge on the old Highway 277. This species prefers grassy areas (Davis and Schmidly 1994) and its range is surely limited within Amistad NRA. This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, and *P. leucopus*.

*Onychomys leucogaster* (Weid 1841) (Northern Grasshopper Mouse): No grasshopper mice have been collected within the boundaries of Amistad NRA. Three specimens (USNM 023950, USNM 023951, & USNM 023952) were collected near Comstock, by W. Lloyd in 1890. Davis and Schmidly (1994) note that the species is “never very common as compared with other small mammals” and do not spend much time in one place. The habits of this mouse make it difficult to assess its status within Amistad NRA.

*Sigmodon hispidus* Say and Ord 1825 (Hispid Cotton Rat): Fifty-four cotton rats were captured throughout Amistad NRA in association with grassy areas. Eight specimens of cotton rat (SRSU 3112, SRSU 3116, SRSU 3117, SRSU 3120, SRSU 3121, SRSU 3122, SRSU 3148, & SRSU 3150) were collected during the study. This species was common on rights-of way and flood zones where exotic herbaceous vegetation was abundant. The species was captured in association with *Peromyscus pectoralis*, *Mus musculus*, *Perognathus merriami*, *Neotoma micropus*, *N. leucodon*, *Peromyscus pectoralis*, *Peromyscus eremicus*, *Spermophilus mexicanus*, *Ammospermophilus interpres*, *Baiomys taylori*, and *Chaetodipus intermedius*.

*Neotoma leucodon* Merriam 1894 (Eastern White-throated Woodrat): A total of four white-throated woodrats were captured and three specimens (SRSU 3123, SRSU 3125, & SRSU 3131) were collected during the study. Woodrats were typically captured in association with prickly pear (*Opuntia* spp.). Prickly pear provides not only shelter, but also food and water (Davis and Schmidly 1994). This species is considered common on the study area. This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, *Neotoma micropus*, *Spermophilus mexicanus*, *P. eremicus*, *Ammospermophilus interpres*, and *Perognathus merriami*.

*Neotoma micropus* Baird 1855 (Southern Plains Woodrat): A total of three Southern Plains woodrats were captured and one specimen (SRSC 3124) was collected during the study. These woodrats are typically captured in association with cactus or thorny desert shrubs. They build a house of sticks, joints of cactus, thorns, and most other available material. Houses can be a meter or more high with multiple openings (Davis and Schmidly 1994). During trapping efforts many of these houses were observed, suggesting that the species is common in desert scrub habitats in Amistad NRA. This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, *Neotoma leucodon*, *Spermophilus mexicanus*, *P. eremicus*, *Ammospermophilus interpres*, and *Perognathus merriami*.

*Ondatra zibethicus* (Linnaeus 1766) (Common Muskrat): The loss of true riparian habitat, along with the introduction of the exotic nutria, may have caused the extirpation of this species within Amistad NRA. Lobello (1976) and Ditton and Schmidly (1977) list the species as extirpated from Amistad NRA. Without natural flood regimes to allow

regeneration of riparian vegetation, it is unlikely this species will ever occur within the park.

#### Family Erethizontidae

*Erethizon dorsatum* (Linnaeus 1758) (North American Porcupine): Porcupines were seen throughout Amistad NRA, with 10 live individuals and nine roadkills observed and/or examined. Two skulls (SRSU 3154 & SRSU 3193) were collected from roadkilled animals. This species is considered to be common throughout the park.

#### Order Carnivora

#### Family Canidae

*Canis latrans* Say 1823 (Coyote): Only one sighting of a coyote occurred during the study. The animal was observed running down a mowed fence line 0.8 km south of the Hunt Area 5 entrance. This animal was considered uncommon by Boston (1966), Lobello (1976), and Ditton and Schmidly (1977). All listed extensive trapping and shooting by ranchers as the main cause of the low numbers and both are still common practices on private lands adjacent to the park.

*Urocyon cinereoargenteus* (Schreber 1775) (Common Gray Fox): Only one sighting of this species occurred during the study, although spoor was observed at multiple locations throughout Amistad NRA. The individual was sighted below Amistad Dam by a group being led on a “bird walk” by park personnel. Mr. Acy, security officer for the International Boundary Water Commission, (pers. comm.) reported seeing foxes foraging on insects under streetlights on the bridge crossing the dam.

### Family Ursidae

*Ursus americanus* Pallas 1780 (American Black Bear): Tracks of a bear were verified by former Resource Manager David Larson on 4 November 1998. The bear was probably a dispersing juvenile from the population in the Serranias del Burro in Mexico. It is doubtful that black bears could become established within Amistad NRA.

### Family Procyonidae

*Bassariscus astutus* (Lichtenstein 1830) (Ringtail): Two ringtails were captured and one specimen (SRSU 3192) was collected along the Pecos River. One ringtail was also captured below Skiles Ranch in Langtry and several were seen near Evans Creek. This nocturnal carnivore is considered to be locally abundant in riparian areas with dense vegetation along the Rio Grande and Pecos River.

*Procyon lotor* (Linnaeus 1758) (Northern Raccoon): The raccoon was the most common carnivore encountered during the study. Eight raccoons were captured and one skull (SRSU 3153) was collected from a roadkill near the entrance to Diablo East. Raccoons could be easily seen at night in any of the visitor areas and roadkills were very common throughout the park.

### Family Mustelidae

*Mustela frenata* Lichtenstein 1831 (Long-tailed Weasel): No specimen of weasel has been collected from Amistad NRA. Lobello (1976) and Ditton and Schmidly (1977) listed it as probable within park boundaries. The range of this species overlaps the range of its main prey items, pocket gophers and ground squirrels. The latter prey item is abundant in the park and it is likely that more extensive trapping might reveal this species as a resident of Amistad NRA.

*Taxidea taxus* (Schreber 1777) (American Badger): One badger (SRSU 3194) was trapped and collected in Eagle Nest Canyon on Jack Skiles Ranch by Travis Parker of the Texas Department of Agriculture's Wildlife Services. Sign of badgers was also observed on private ranch land near Box Canyon.

#### Family Mephitidae

*Spilogale gracilis* Merriam 1890 (Western Spotted Skunk): Two specimens were encountered during the study. One spotted skunk was captured below Skiles Ranch in Langtry along the Rio Grande. A roadkill was found at the intersection of Highway 90 and Spur 454, but was not salvaged. The location of the two individuals would indicate that these skunks occur throughout Amistad NRA in a variety of habitats.

*Mephitis mephitis* (Schreber 1776) (Striped Skunk): This is the most common skunk in Amistad NRA. One specimen (SRSU 3136) was collected near the intersection of Highway 90 and the entrance to Diablo East. Two striped skunks were trapped and numerous others encountered throughout the park. This species is considered very common.

*Conepatus leuconotus* (Lichtenstein 1832) (White-backed Hog-nosed Skunk): Two roadkill hog-nosed skunks were found within Amistad NRA. Neither could be salvaged. One specimen was found 0.5 km north of Highway 277 North Bridge and the other was found 1 km west of Diablo East entrance on Highway 90. This species can be found throughout the park in low densities.

#### Family Felidae

*Puma concolor* (Linnaeus 1771) (Mountain Lion): Only two reports of mountain lions were made during the study. Both reports were from local citizens of Langtry in



December and were probably the same animal. No spoor was found within park boundaries, but it is believed that mountain lions may use the park as a travel corridor.

*Lynx rufus* (Schreber 1777) (Bobcat): Only two bobcats were observed during the study. Whitney Howeth (pers. comm.) observed a lone bobcat near the entrance to the Boy Scout Camp on park property. The other individual was trapped in Eagle Nest Canyon by Travis Parker of the Texas Department of Agriculture Wildlife Services and the skull collected (SRSU 3152) for museum deposition.

#### Order Artiodactyla

#### Family Tayassuidae

*Pecari tajacu* (Linnaeus 1758) (Collared Peccary): Spoor of the collared peccary was observed at Diablo East Bank Fishing/Picnic Area and Hunt Area 3. Jack Skiles (pers. comm.) reported occasionally seeing a small herd of peccaries in Langtry. Several park rangers (pers. comm.) reported seeing large groups (>10 individuals) of peccaries at Diablo East in the past. Both Lobello (1976) and Ditton and Schmidly (1977) listed the peccary as uncommon in the park and observations during this study supports this observation.

#### Family Cervidae

*Odocoileus hemionus* (Rafinesque 1817) (Mule Deer): No mule deer were observed during the study. Lobello (1976) reported one record near Langtry. The species may still be found in extreme western areas of the park, but conversations with land owners near Langtry indicate the species is quite uncommon.

*Odocoileus virginianus* (Zimmerman 1780) (White-tailed Deer): White-tailed deer were seen throughout Amistad NRA. Deer are increasing in number as evidenced by

the many individuals that are killed on the roads throughout the area. This deer is an important game animal to Amistad NRA, as many hunters pursue this animal on the hunt areas within the park.

#### Family Bovidae

*Bos bison* (Linnaeus 1758) (American Bison): Long extirpated from the region, bison were last recorded in Val Verde County, in 1894 (Trefethen 1975:17). Three bison skulls were collected (USNM 126620, USNM 126621, & USNM 126622) “10 miles East of Langtry” by J. H. Gaut, in 1903. The shift from a grass-dominated to a shrub dominated community at Amistad NRA, makes reintroduction of this species unlikely.

#### Feral Mammals

#### Order Rodentia

#### Family Muridae

*Mus musculus* Linnaeus 1758 (House Mouse): The house mouse has become established throughout the United States. During this study, 17 house mice were captured and three specimens (SRSU 3127, SRSU 3160, & SRSU 3172) were collected. This species was captured at Governor’s Landing and in the Pecos River flood zone 0.5 km south of the Highway 90 bridge. Both areas were dominated by exotic grasses (*Cynodon* and *Pennisetum*). This species was captured in association with *Peromyscus pectoralis*, *Sigmodon hispidus*, *P. leucopus*, *Neotoma albigula*, *N. micropus*, and *Spermophilus mexicanus*.

*Rattus rattus* (Linnaeus 1758) (Black Rat): No black rats were captured during the current study. Boston (1966) collected (SRSU 957 & SRSU 958) this species in Del Rio

living in irrigation ditches. The species can be expected to occur in areas of the park where it can live as a commensal with man.

#### Family Myocastoridae

*Myocaster coypus* (Molina 1782) (Nutria): Boston (1966) listed this species from San Felipe Creek and the mouth of the Devils River. One skull (SRSU 3184) was collected near the entrance to an abandoned railroad tunnel below the Lowry Ranch. No live specimens were observed during the study. Lobello (1976) listed anecdotal reports of nutria gnawing in styrofoam boat docks near Rough Canyon. The species has been known to overpopulate and cause problems in other areas of Texas (Davis and Schmidly 1994), but does not appear to be doing so in Amistad NRA.

#### Order Carnivora

##### Family Felidae

*Felis catus* Linnaeus 1758 (Feral Cat): The feral cat is an exotic predator known to cause problems when introduced. These animals are efficient predators and compete with native predators for limited resources. Approximately 20 cats were observed at Governor's Landing and another 15 observed at Diablo East. During the study, five feral cats were removed and two skulls collected (SRSU 3155 & SRSU 3156). The park should attempt to remove feral cats from within the park and also educate local people and park visitors of the problems associated with feral cat populations.

#### Order Artiodactyla

##### Family Suidae

*Sus scrofa* Linnaeus 1758 (Feral Pig): Feral pigs were observed on the Rio Grande from Langtry, Texas, to the confluence with the Pecos River. Local ranchers have

reported seeing pigs for approximately the past five years (Jack Skiles pers. comm.). During the current study >30 pigs were recorded and the skulls of two individuals (SRSU 3157 & SRSU 3158) were collected. On multiple occasions, pigs were seen crossing the Rio Grande. The fact that these animals readily cross back and forth from Mexico make attempts to eradicate or even control feral populations extremely difficult.

#### Family Bovidae

*Ovis aries* Schreber 1782 (European Mouflon Sheep): A population >300 mouflon occurred in Hunt Area 5 (pers. obs.). The park is currently developing a management plan to attempt to eradicate this animal within park boundaries (Park Personnel, pers. comm.). Management plans should be carried out in a rapid manner to ensure that mouflon populations do not become established in other areas of the park. The highly gregarious nature of this animal may help to confine it to certain areas within the park, but spoor of mouflon was observed near 277 N. campground and could be a sign that the population is expanding its range within Amistad NRA.

*Ammotragus lervia* (Pallas 1777) (Aoudad or Barbary Sheep): Five aoudad were seen in Hunt Area 4 on the morning of 9 August 2003. The group was comprised of four females and one male. Whitney Howeth (Biological Technician, pers. comm.) reported seeing one individual in Hunt Area 2. Given that mouflon have already established a feral population within the park, it is imperative that the park take a proactive approach to eliminate this exotic from within park boundaries.

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Appendix 1. Coordinates for small mammal, bat, and medium-sized mammal sampling sites at Amistad National Recreation Area, Val Verde County, Texas, 2003. All

coordinates are based on the North American Datum 1983, and are presented in Universal Transverse Mercator coordinates in Zone 14R.

Small Mammal Sampling Sites		
Site	Easting	Northing
1	305479	3262744
2	304544	3261995
3	309918	3261594
4	315407	3263637
5	314356	3265899
6	305533	3270658
7	304677	3270712
8	303554	3271541
9	271970	3288507
10	272120	3288493
11	301410	3257593
12	253497	3300080
13	315600	3264027
14	303705	3271084
15	289257	3268133
16	306377	3284366
17	306429	3284084
18	315348	3265964
19	314624	3266993
20	314956	3262944
21	300631	3264408

Bat Sampling Sites		
Site	Easting	Northing
1	271809	3288270
2	267720	3292180
3	301306	3257779
4	314908	3263787
5	315203	3265980
6	306401	3284270
7	254349	3300482
8	299278	3268153
9	271341	3283177



## Appendix 1. Continued.

Medium-sized Mammal Sampling Sites		
Site	Easting	Northing
1	254332	3300382
2	253336	3300047
3	271779	3288159
4	305486	3265689
5	301983	3261941
6	304467	3262076
7	300716	3258529
8	301927	3256939
9	306402	3284131

Appendix 2. Status of the mammalian fauna at Amistad National Recreation Area, Val Verde County, Texas, 2003.

Order	Family	Species	Status <sup>a</sup>	Reference <sup>b</sup>
Didelphimorphia	Didelphidae	<i>Didelphus virginiana</i>	V	2,3,4
Insectivora	Soricidae	<i>Cryptotis parva</i>	P	8
		<i>Notiosorex crawfordi</i>	P	1
Chiroptera	Mormoopidae	<i>Mormoops megalophylla</i>	V	4,5
	Phyllostomidae	<i>Diphylla ecaudata</i>	A	9
	Vespertilionidae	<i>Myotis velifer</i>	V	2,3,4
		<i>Myotis yumanensis</i>	V	2,3,4
		<i>Lasiurus borealis</i>	P	6
		<i>Lasiurus cinereus</i>	V	4,6
		<i>Lasiurus seminolus</i>	P	6
		<i>Pipistrellus hesperus</i>	V	2,3,4
		<i>Pipistrellus subflavus</i>	V	4,8,9
		<i>Eptesicus fuscus</i>	A	2
		<i>Nycticeius humeralis</i>	V	4
		<i>Corynorhinus townsendii</i>	V	4,5
		<i>Antrozous pallidus</i>	V	2,3,4
	Molossidae	<i>Tadarida brasiliensis</i>	V	1,2,3,4
		<i>Nyctinomops femorosaccus</i>	V	4
		<i>Nyctinomops macrotis</i>	V	4
		<i>Eumops perotis</i>	V	4,5
Xenarthra	Dasypodidae	<i>Dasypus novemcinctus</i>	V	2,3,4
Lagomorpha	Leporidae	<i>Sylvilagus audubonii</i>	V	1,3,4,8
		<i>Sylvilagus floridanus</i>	V	2,4,8
		<i>Lepus californicus</i>	V	1,2,3,4
Rodentia	Sciuridae	<i>Ammospermophilus interpres</i>	V	1,2,3,4
		<i>Spermophilus mexicanus</i>	V	1,2,3,4
		<i>Spermophilus spilosoma</i>	P	2,3
		<i>Spermophilus variegatus</i>	V	1,2,3,4
		<i>Sciurus niger</i>	E	1,8
	Geomyidae	<i>Thomomys bottae</i>	P	2,3,8
		<i>Geomys personatus</i>	E	2,3
		<i>Cratogeomys castanops</i>	P	9
	Heteromyidae	<i>Perognathus merriami</i>	V	1,2,3,4
		<i>Chaetodipus eremicus</i>	P	8
		<i>Chaetodipus hispidus</i>	V	3,4
		<i>Chaetodipus intermedius</i>	V	4
		<i>Chaetodipus nelsoni</i>	V	2,3,4
		<i>Dipodomys merriami</i>	P	8
	Castoridae	<i>Castor canadensis</i>	V	1,2,3,4
	Muridae	<i>Reithrodontomys fulvescens</i>	P	8
		<i>Peromyscus eremicus</i>	V	4
		<i>Peromyscus leucopus</i>	V	1,2,3,4
		<i>Peromyscus maniculatus</i>	P	8
		<i>Peromyscus pectoralis</i>	V	1,2,3,4
		<i>Baiomys taylori</i>	V	4
		<i>Onychomys leucogaster</i>	P	8
		<i>Sigmodon hispidus</i>	V	1,2,3,4
		<i>Neotoma leucodon</i>	V	1,2,3,4
		<i>Neotoma micropus</i>	V	1,2,3,4
		<i>Rattus rattus</i>	P	1

## Appendix 2. Continued.

Order	Family	Species	Status <sup>a</sup>	Reference <sup>b</sup>
Rodentia (cont.)	Muridae (cont.)	<i>Mus musculus</i>	V	1,2,3,4
		<i>Ondatra zibethicus</i>	E	2,3
Carnivora	Erethizontidae	<i>Erethizon dorsatum</i>	V	1,2,3,4
	Myocastoridae	<i>Myocaster coypus</i>	V	2,3,4
	Canidae	<i>Canis latrans</i>	V	2,3,4
		<i>Urocyon cinereoargenteus</i>	V	1,2,3,4
	Ursidae	<i>Ursus americanus</i>	V	4
	Procyonidae	<i>Bassariscus astutus</i>	V	1,2,3,4
		<i>Procyon lotor</i>	V	1,2,3,4
	Mustelidae	<i>Mustela frenata</i>	P	2,3
		<i>Taxidea taxus</i>	V	1,4
	Mephitidae	<i>Spilogale gracilis</i>	V	1,2,3,4
		<i>Mephitis mephitis</i>	V	1,2,3,4
		<i>Conepatus leuconotus</i>	V	1,2,3,4
	Felidae	<i>Felis catus</i>	V	4
		<i>Puma concolor</i>	V	1,2,3,4
		<i>Lynx rufus</i>	V	1,2,3,4
Artiodactyla	Suidae	<i>Sus scrofa</i>	V	4
	Tayassuidae	<i>Pecari tajacu</i>	V	1,2,3,4
	Cervidae	<i>Odocoileus hemionus</i>	P	1,2
		<i>Odocoileus virginianus</i>	V	1,2,3,4
	Bovidae	<i>Bos bison</i>	E	8
		<i>Ovis aries</i>	V	4
		<i>Ammotragus lervia</i>	V	4

<sup>a</sup> V = vouchered, P = probable, E = extirpated, A = accidental (recorded, but not thought to be a regular resident species)

<sup>b</sup> 1 = Boston (1966), 2 = Lobello (1976), 3 = Ditton and Schmidly (1977), 4 = this study, 5 = Weyandt et al. (2001), 6 = Brant and Dowler (2001), 7 = Davis and Schmidly (1994), 8 = National Museum of Natural History, 9 = Museum of Texas Tech University